CLAIMS

1. An injection nozzle for an internal combustion engine, the injection nozzle comprising;

a nozzle body (16) provided with a bore defining a valve seating surface (14) having a seat cone angle (ϑS);

a valve member (10) which is moveable within the bore,

wherein the valve member (10) includes an upstream seat region (22) defining an upstream cone angle (ϑB), the upstream cone angle (ϑB) and the seat cone angle (ϑS) together defining a first differential angle between them, and a downstream seat region (20, 24) defining a downstream cone angle (ϑA), the downstream cone angle (ϑA) and the seat cone angle (ϑS) together defining a second differential angle between them;

the valve member (10) further comprising a protruding annular ridge (40) intermediate the upstream seat region (22) and the downstream seat region (20, 24), wherein the protruding annular ridge (40, 44, 46) defines a seating line (112) having a seat diameter, the seating line (112) being engageable with the valve seating surface (14) to control fuel injection from the nozzle body (16).

2. The injection nozzle as claimed in claim 1, wherein the protruding annular ridge (40) includes an upstream ridge region (44) and a downstream ridge region (46), the seating line (112) being defined at an intersection between said upstream and downstream ridge regions (44, 46).

3. The injection nozzle as claimed in claim 2, wherein the valve member (10) includes a circumferential groove (48) arranged downstream of the downstream ridge region (46) and immediately upstream of a further region (24), wherein a lower edge of the circumferential groove and the further region (24) define an intersection which defines, together with the seating surface (14), a radial clearance that is sufficiently small so that a lower portion of the downstream ridge region (46) defines a load bearing surface for the valve member (10).

4. The injection nozzle as claimed in any one of claims 1 to 3, wherein the upstream ridge region (44) is immediately downstream of, or forms an integral part of, the upstream seat region (22) and wherein the downstream ridge region (46) is immediately upstream of, or forms an integral part of, the downstream seat region (20).

5. The injection nozzle as claimed in any one of claims 1 to 4, wherein the first differential angle is smaller than the second differential angle.

6. The injection nozzle as claimed in any one of claims 1 to 4, wherein the first differential angle is greater than the second differential angle.

7. The injection nozzle as claimed in any one of claims 1 to 4, wherein the first differential angle is selected to be substantially the same as the second differential angle so that, regardless of wear of the seating line (112), in use, the seat diameter maintains a substantially constant value.

8. The injection nozzle as claimed in any one of claims 1 to 7, wherein the protruding annular ridge (40, 44, 46) is shaped so that the upstream region (22)

defines, together with the seating surface (14), a radial clearance of no more than 10 μm.

9. The injection nozzle as claimed in any one of claims 1 to 8, wherein the protruding annular ridge (40, 44, 46) is shaped so that a region (24) of the valve member (10) adjacent thereto on a downstream side of the seating line (112) defines, together with the seating surface (14), a radial clearance of no more than 10 μm.

10. The injection nozzle as claimed in claim 9, wherein the region adjacent to the ridge (40, 44, 46) on the downstream side of the seating line (112) is a valve tip region (24).

11. The injection nozzle as claimed in claim 10, wherein the valve tip region (24) includes a chamfered tip (28).

12. The injector nozzle as claimed in any one of claimed 1 to 11, being one of (i) VCO-type or (ii)sac-type.